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ABSTRACT

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories, and is funded by the National Institute of Education. Its major purpose is the development of curriculum materials in mathematics for grades K-6. Beginning in September, 1973, CSMP began an extended pilot trial of its Elementary Program. This report compares the performance of two groups of first grade CSMP students; the teachers of the first group were new to CSMP and the teachers of the second group were teachers who had previously taught CSMP. Considered were various questions regarding the teachers, the students, and the materials. It was concluded that CSMP teachers did just as well the second year as the first; any loss of novelty was offset by experience. The data appeared to support evaluations in the first year of the program. (RH)

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EXTENDED PILOT TRIALS OF THE COMPREHENSIVE SCHOOL MATHEMATICS PROGRAM:

EVALUATION REPORT SERIES

Evaluation Report 2-B-2

Readministration of First Grade Test Items

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Extended Pilot Trial of the
Comprehensive School Mathematics Program

Evaluation Report 2-B-2

READMINISTRATION OF FIRST GRADE TEST ITEMS

Edward L. Barszcz
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October, 1975

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Description of Evaluation Report Series

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories, and is funded by the National Institute of Education. Its major purpose is the development of curriculum materials for grades K-6.

Beginning in September, 1973, CSMP began an extended pilot trial of its Elementary Program. The pilot trial is longitudinal in nature; students who began using CSMP materials in kindergarten or first grade in 1973-74, were able to use them in first and second grades respectively in 1974-75, and will be able to use them in second and third grades in 1975-76. Hence the adjective "extended". The limited scope of these trials does not justify the term "field trial" since the major focus of the evaluation is on a limited number of classes in the metropolitan St. Louis area.

The evaluation of the program in this extended pilot trial is intended to be reasonably comprehensive and to supply information desired by a wide variety of audiences. For that reason the reports in this series are reasonably non-technical and do not attempt to widely explore some of the related research issues. The list of reports from the first two years of the extended pilot trial is given on the next page. The most comprehensive of these are the following:

1-A-1: Overview, Design and Instrumentation
1-A-3: Final Summary Report, Year 1
and 2-A-1: Final Summary Report, Year 2

The first of these will be particularly useful to the reader in providing a description of the program, the philosophy and goals of the evaluation and the relationship of individual reports to the evaluation effort as a whole.

Longitudinal Pilot Study of the
Comprehensive School Mathematics Program

Evaluation Report Series

Evaluation Report 1-A-1	Overview, Design and Instrumentation
Evaluation Report 1-A-2	External Review of CSMP Materials
Evaluation Report 1-A-3	Final Summary Report Year 1
Evaluation Report 1-B-1	Mid-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-2	End-of-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-3	End-of-Year Test Data: Standard First Grade Content
Evaluation Report 1-B-4	End-of-Year Test Data: CSMP Kindergarten Content
Evaluation Report 1-B-5	Test Data on Some General Cognitive Skills Related to CSMP Content
Evaluation Report 1-B-6	Summary Test Data: Detroit Schools
Evaluation Report 1-C-1	Teacher Training Report
Evaluation Report 1-C-2	Observations of CSMP First Grade Classes
Evaluation Report 1-C-3	Mid-Year Data from Teacher Questionnaires
Evaluation Report 1-C-4	End-of-Year Data from Teacher Questionnaires
Evaluation Report 1-C-5	Interviews with CSMP Kindergarten Teachers
Evaluation Report 1-C-6	Analysis of Teacher Logs
Evaluation Report 2-A-1	Final Summary Report Year 2
Evaluation Report 2-B-1	Second Grade Test Data
Evaluation Report 2-B-2	Readministration of First Grade Test Items
Evaluation Report 2-B-3	Student Interviews
Evaluation Report 2-C-1	Teacher Questionnaire Data
Evaluation Report 2-C-2	Teacher Interviews, Second Grade
Evaluation Report 2-C-3	Teacher Interviews, First Grade

Key to Indexing

1-C-2 Observations of CSMP First Grade Classes

"2" refers simply to the number within a given year and type of data

"C" refers to the type of data being reported
- A: Overview, summary and theoretical reports
- B: Student outcomes
- C: Non-test data

"1" refers to the year of the Pilot Study according to the following:

	Kindergarten	First Grade	Second Grade	Third Grade	. . .
Year 1 (1973-74)	▨	▨			
Year 2 (1974-75)		▨	▨		
Year 3 (1975-76)			▨	▨	

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Introduction

In the fall of 1973, the Comprehensive School Mathematics Program (CSMP) began a longitudinal pilot study of its Elementary Program. Over 100 teachers began using the program, either in first grade or kindergarten. During the 1974-75 school year just past, the second year of this pilot study, most of these classes continued into second grade and first grade respectively and many new classes began using CSMP materials.

For the purposes of the pilot study, classes in the St. Louis area are designated "local". For these classes teacher training is standardized and comparison classes established. These local classes provide much of the evaluation data derived from the pilot study including data related to classroom observations, student and teacher interviews and individualized testing. Classes not in the St. Louis area are designated "outer ring". These classes provide information concerning usage of materials (via questionnaires and teacher logs) and various corroborative test data from cooperating sites.

The major purpose of this report is to compare the performance of two groups of first grade CSMP students; the teachers of the first group were new to CSMP and the teachers of the second group were the same teachers one year later. A lower performance the second year would support the contention that results* obtained in the first year of the pilot study, 1973-74, were at least partly due to the enthusiasm of the teachers for a novel math program. A higher performance would support the view that teachers the second time around more than made up for any loss of enthusiasm because they were more familiar with the program.

The classes used to investigate this issue were those of teachers 1-12 in the chart below, ie., all local teachers who began using CSMP in 1973-74 ("last year") and continued using it in 1974-75 ("this year").

Teacher	1973-74	1974-75
#1		
2		
3		
4		
5		
6	taught CSMP for the first time	taught CSMP for the second time
7		
8		
9		
10		
11		
12		
1*		
2*	comparison teachers for teachers 1-5 above	taught CSMP for the first time
3*		
4*		
5*		

*Evaluation Report 1-B-2: End-of-Year Test Data: CSMP First Grade Content and Evaluation Report 1-B-3: End-of-Year Test Data: Standard First Grade Content

The classes of teachers 1* - 5* in the above chart provide information regarding two other issues. One addresses the possibility that CSMP teachers in the first year of the pilot study were systematically better than teachers who served as comparison teachers. The performance of the students of teachers 1-5 in their first year of teaching CSMP, 1973-74, is compared with performance of the students of teachers 1* - 5* in their first year of teaching CSMP, 1974-75.

The other issue is a partial replication of the CSMP - Non-CSMP comparisons made originally in 1973-74. To do this, the performance of the students of teachers 1* - 5* in 1973-74 (using a traditional math text) is compared with the performance of the students of the same teachers one year later (using the CSMP program).

In all these comparisons an assumption has been made that the general ability level of students within any of the participating schools has not changed from 1973-74 to 1974-75.

Construction and Administration of the Test

The test used to assess student performance was composed of items selected from two series of tests which were originally constructed for use in May, 1974:

a) Test of Standard (First Grade) Content: These were constructed last year after analyzing five widely used commercial texts to determine the relative emphasis these texts placed on various content areas. A series of eight short test scales was constructed. They were not intended to be mastery tests, merely tasks which were representative of those in which students were engaged on a day-to-day basis in the classroom.

b) Test of CSMP (First Grade) Content: These were constructed using the first six workbook series as the basic source of items. It was felt that the problems students worked on in the workbook series provided the most accurate indication of what should be expected of the students.*

The content topics included in the tests of Standard and CSMP Content last year appear below.

Standard First Grade Content Test	CSMP Content Test
Numerals and Counting	Multiplication
Addition	Integers
Subtraction	Rationals - shading
Order	Rationals - multiplication
Place Value	Counting of money
Applications	Minicomputer - addition, subtraction, multiplication
Measurement	Relations
Larger Numbers	Addition
	Subtraction
	Order
	Probability
	Venn Diagrams

Each of these content topics was considered for inclusion in the test for first grade CSMP students this year. Place Value, Probability, Venn Diagrams, and Applications were excluded from the final test form because it was felt they could not be adequately covered in a reasonably short (40-50 minute) classroom testing situation. Rationals - shading was also excluded because of the high percentage of correct responses on these items last year.

*For a complete description of the construction, administration and student outcomes for the two series of tests, the reader is referred to Evaluation Report 1-B-2 End-of-Year Test Data: Standard First Grade Content and Evaluation Report 1-B-3 End-of-Year Test Data: CSMP First Grade Content.

The content topics selected for the end-of-year test are described below. Within each content topic, the items were selected to make this year's test as representative as possible of last year's test. Items at all difficulty levels were included so that either a decline or an improvement in performance would be readily apparent. The description of the subtests below is necessarily brief but the tests are reproduced in full in the appendix.

1. Addition (2 subtests - 9 items)
   Pairs of numbers whose sum is
   1) less than 10, with a dot picture given for each item (3 items)
   2a) less than 10 (2 items)
   b) between 10 and 20 (2 items)
   c) between 20 and 100, no carrying (1 item)
   d) between 20 and 100, carrying (1 item)

2. Subtraction (2 subtests - 9 items)
   Pairs of numbers
   1) one less than 10 and difference less than 10 with a dot picture given for each item (3 items)
   2a) both less than 10 (2 items)
   b) one less than 10, and difference less than 10 (2 items)
   c) between 20 and 100, no borrowing (1 item)
   d) between 20 and 100, borrowing (1 item)

3. Multiplication (1 subtest - 4 items)
   Pairs of numbers less than 10 whose product is less than 10 (3 items) or between 10 and 20 (1 item)

4. Rationals (1 subtest - 3 items)
   Three problems with a positive rational number (1/2 or 1/3) times a whole number less than 15.

5. Money (1 subtest - 2 items)
   Two problems involving coin recognition and counting money.

6. Integers: (1 subtest - 4 items)
   Four addition problems involving one-digit positive and negative integers whose sum is either positive, negative or zero.

7. Relations (3 subtest - 15 items)
   This topic is covered by an addition spiral (5 items), a composition of functions diagram (5 items) and an "I am shorter than you" diagram (5 items).

8. Numerals and Counting (1 subtest - 6 items)
   Recognizing numerals (2 items)
   Counting by one's, by two's (1 item each)
   Numbers just before and after a given number (1 item each)

9. Order (1 subtest - 2 items)
   One problem selecting the largest number and one problem selecting the smallest number.

10. Larger Numbers (1 subtest - 2 items)
    This test involved estimating the sum of two two-digit numbers with carrying.

11. Minicomputer (2 subtest - 10 items)
    - 1a) Reading numbers represented in standard form on the Minicomputer (2 items)
    - b) Writing a given number on the the Minicomputer (2 items)
    - 2a) Addition problems (2 items)
    - b) Subtraction problems (2 items)
    - c) Multiplication problems (2 items)

Three test booklets were constructed:

Booklet I:	Subtraction, Addition, Money, Multiplication, Relations
Booklet IA:	Addition, Subtraction, Rationals - multiplication, Integers, Relations
Booklet II:	Numerals and Counting, Order, Larger Numbers, Minicomputer.

An effort was made last year in the construction and administration of the tests to create as non-test-like an atmosphere as possible. This procedure was followed again this year. In order to use the available testing time as efficiently, as possible, test booklet I was administered to a random half of each class at the same time as test booklet IA was administered to the other half. This could be done because the format of I and IA was similar to the workbooks in which students were used to working on a regular basis. The students worked through the tests at their own pace, asking questions and getting answers from the test administrators on an individualized basis as they would in their math classes. The test administrators answered questions of a "What to do" nature but merely encouraged, without assisting, on questions of a "How to do it" nature.

After a five minute break, test booklet II was administered. It was necessary to give this to all students at once since the directions for these items had to be read to the students one-at-a time.

Two trained testers conducted all the testing which required a total of about 50 minutes per class. The test was essentially untimed; the testers generally allowed as much time as was necessary for students to finish.

Comparisons: Year 1 to Year 2 with Original CSMP Teachers

Background

Twelve of the 16 teachers in the local area who taught CSMP for the first time in 1973-74 taught it again in 1974-75. (Two of the other four taught second grade CSMP to the same students in 1974-75, one retired from teaching and one was ill for a lengthy period of time during the 1974-75 school year.) Before attributing differences in test scores from 1973-74 to 1974-75 to teacher factors (a decrease in scores to a lessening of teacher enthusiasm with the novel program, an increase to more teacher familiarity with the materials), two other potential factors are noted.

No pretest data was available this year for assessing the comparability in entering student ability between last year's and this year's classes. It was felt that there would be no radical changes in the ability of the students in the same school from one year to the next. However, the teachers were asked how their class this year compared in overall ability with last year's class. Two teachers indicated this year's class was higher in overall ability and three teachers indicated this year's class was lower in overall ability than last year's class. The remaining seven teachers indicated this year's class was the same in overall ability as last year's class.

The teacher logs were checked to see how far each teacher got in the sequence of 308 available lessons compared with last year. Half of the teachers reported they reached approximately (within ten lessons) the same place in the lesson sequence as they did last year; four teachers indicated that they progressed further (20-25 lessons) and two teachers did not get as far (40-50 lessons less).

Table 1 below, shows for each second year CSMP teacher, their last year's and this year's class mean on the total of the 66 items in the test. This data will form the basis for subsequent analysis. Also given in the teacher's estimate of this year's class ability level as compared with last year's and how far each got in the lesson sequence this year as compared with last year.

Table 1

Mean Test Scores, Ability Level and Progress in Lesson Sequence: CSMP Classes 73-74 and 74-75

Class	Means		Ability of 74-75 Class Compared to 73-74	Progress in Lesson Sequence Compared to 73-74
	73-74	74-75		
1	39.5	48.7	higher	same
2	51.6	51.4	higher	20 lessons more
3	49.8	46.9	lower	same
4	44.7	41.0	lower	25 lessons more
5	16.0*	15.8*	lower	45 lessons less
6	40.9	37.1	same	same
7	39.5	48.7	same	same
8	38.3	43.1	same	20 lessons more
9	49.5	51.9	same	same
10	40.1	40.6	same	50 lessons less
11	39.3	39.3	same	23 lessons more
12	23.6	41.3	same	same

*Mean calculated only on test 1, 7, 12, 13, 16 (22 items) because it had not been possible to administer the other tests in 1973-74.

Analysis of Class Means

The class mean scores formed the basis of the analysis. The class mean scores were computed for each of last year's and this year's classes on each subtest. Then the mean of these scores across last year's 12 classes (with inexperienced teachers) was computed as was the mean across this year's 12 classes (the same teachers but with a year of experience in CSMP). Finally a test of significance was made. Technically a two-way analysis of variance procedure with one observation per class was used. One factor was "experience" with two levels, first year and second year of teaching CSMP. The other factor was schools with 12 levels.

Table 2 below provides the essential data of this report. It shows for each subtest the mean score across classes with an inexperienced and experienced CSMP teacher. Appendix A gives, for each teacher, the mean raw score for this year's and last year's class on each subtest. Last year one of the CSMP classes was involved in only part of the testing program, hence data was available for all 12 classes on only five subtests (1, 7, 12, 13, 16).

The P-value shown in Table 2 is based on the assumption that there is no real difference between last year's and this year's classes and that the actual differences observed were chance events. The P-value is the probability of this large a difference occuring by chance under that assumption. Generally if the probability is low, then one tends to reject the hypothesis of no difference between groups.

Table 2

Mean Raw Test Scores for CSMP Classes with Experienced and Inexperienced Teachers

Subtest (Number of Items)	First Year CSMP Teachers 1973-74 "Inexperienced"	Second Year CSMP Teachers 1974-75 "Experienced"	F-test: P less than (degree of freedom)
Subtest 1: Subtraction* (6)	3.1	3.6	.13 df(1,11)
Subtest 2: Addition with dots (3)	2.4	2.5	.77 df(1,10)
Subtest 3: Counting money (2)	1.5	1.6	.44 df(1,10)
Subtest 4: Multiplication (4)	2.4	2.3	.69 df(1,10)
Subtest 5: Relations ("I am shorter") (5)	2.9	3.2	.42 df(1,10)
Subtest 6: Relations (composition of functions) (5)	3.0	3.4	.35 df(1,10)
Subtest 7: Addition* (6)	4.2	4.4	.39 df(1,11)
Subtest 8: Subtraction with dots (3)	2.7	2.5	.44 df(1,10
Subtest 9: Rationals - multiplication (3)	1.5	1.6	.56 df(1,10
Subtest 10: Integers (4)	2.8	3.2	.18 df(1,10
Subtest 11: Relations (+3 spiral) (5)	3.5	4.1	.051 df(1,10)
Subtest 12: Numerals and Counting* (6)	4.4	4.7	.30 df(1,11)
Subtest 13: Order* (2)	1.6	1.6	.42 df(1,11)
Subtest 14: Minicomputer - reading and writing (4)	2.8	3.0	.54 df(1,10)
Subtest 15: Minicomputer addition subtraction multiplication (6)	2.6	2.6	.93 df(1,10)
Subtest 16: Larger Numbers* (2)	.4	.6	.005 df(1,11)
Subtests 1,7,12,13,16* (22)	13.7	14.8	.054 df(1,11)
Subtests (2,3,4,5,6,8,9,10,11,14,15) (44)	28.1	29.9	.27 df(1,10)
Total Score	41.5	44.5	.17 df(1,10)

*Comparisons were made on 12 classes for these subtests. Eleven classes were used for the rest of the comparisons.

It can be seen that the 1974-75 classes (teachers in their second year of CSMP), had a higher total score than did the 1973-74 classes (teachers in their first year of CSMP), though the difference was not significant. The pattern was fairly consistent across subtests; on 14 of the 16 subtests the classes with experienced teachers had scores as high or higher than the classes with inexperienced teachers.

In particular Test 16, Larger Numbers is the only test on which there is a significant difference (at the .05 level) in student performance and it is in favor of the classes with an experienced CSMP teacher. On Test 11, Relations (a +3 addition spiral) the classes with an experienced CSMP teacher had higher scores than classes with an inexperienced teacher with a P-value less than .06. The significance of the difference does not reach the .05 level of probability but would lead one to suspect there were real differences in favor of classes with an experienced CSMP teacher.

Item Analysis

The remainder of this chapter is devoted to an item-by-item comparison of last year's versus this year's students. It is an attempt to determine which particular areas students did better on and on which they did worse. Actually it is, in a sense, supplemental information; the major question comparing overall student achievement when the teachers are new to CSMP and after they have taught it for a year has already been answered.

Tables 3-18 on the following pages list the items within each test and the percent correct for last year's and this year's classes. For convenience, the items have been abbreviated from their original form. The reader will find the original forms of the test in Appendix B. A star has been placed beside each item in which there was a significant difference (at the .05 level) between the two groups of students. The level of significance was computed with the statistic shown below.* Generally, a difference of between 10 and 12 percent correct would be significant at the .05 level depending on the average difficulty level of the item. All starred items are assumed to have produced differences in responses between the two groups which cannot be passed off as a "chance" difference.

The KR20 Reliability Coefficients shown for each test are measures of the homogeneity of the test or the extent to which the items on the test measure the same attribute. The range of the coefficient is generally between 0 and 1. The mean KR20 for the various subtests was .72, though the small numbers of items in each subtest lessen the interpretability of this statistic.

*In the fourfold table

	Correct	Incorrect	Total
with inexperienced teachers	A	B	N_1
with experienced teachers	C	D	N_2
Totals	N_a	N_b	N

Where the letters represent numbers of students, the statistic is assumed to be distributed as χ^2 with one degree of freedom.

$$\frac{(AD-BC)^2 \cdot N_1 N_2}{N_1 N_2 N_a N_b}$$

Table 3

Item Analysis for Subtest 1
Subtraction

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	5 - 1 = ☐	81	80
2	9 - 9 = ☐	74	81
3	10 - 6 = ☐	72	74
4	11 - 3 = ☐	59	67
5	80 - 20 = ☐	27	34
6	31 - 19 = ☐	9	15
	Mean % Correct	54	59
	Number of students	127	124
	KR20	.79	.81

Table 4

Item Analysis for Test 2
Addition-Dot Pictures

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	6 + 1 = ___	96	91
2	6 + 3 = ___	78	87
3	0 + 8 = ___	63	62
	Mean %	79	80
	Number of students	100	114
	KR20	.20	.55

Table 5

Item Analysis for Subtest 3
Counting Money

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	How much money is shown? (2 dimes and 1 penny)	68	80
2	How much money is shown? (5 dimes)	68	75
	Mean % Number of students KR20	68 106 .76	78 114 .67

Table 6

Item Analysis for Subtest 4
Multiplication

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	2 x 3 = ___	85	88
2	1 x 9 = ___	55	54
3	3 x 4 = ___	49	49
4	0 x 7 = ___	27	37
	Mean % Number of students KR20	54 106 .70	57 114 .67

Table 7

Item Analysis for Subtest 5
Relations - "I am shorter than"

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	Drawing an arrow from Kim to Joe	58	54
2	Drawing an arrow from Kim to Carl	57	66
3*	Drawing an arrow from Joe to Carl	53	68
4*	Drawing an arrow from Joe to Sue	54	64
5	Drawing an arrow from Sue to Carl	53	49
	Mean % Number of students KR20	55 106 .91	71 114 .83

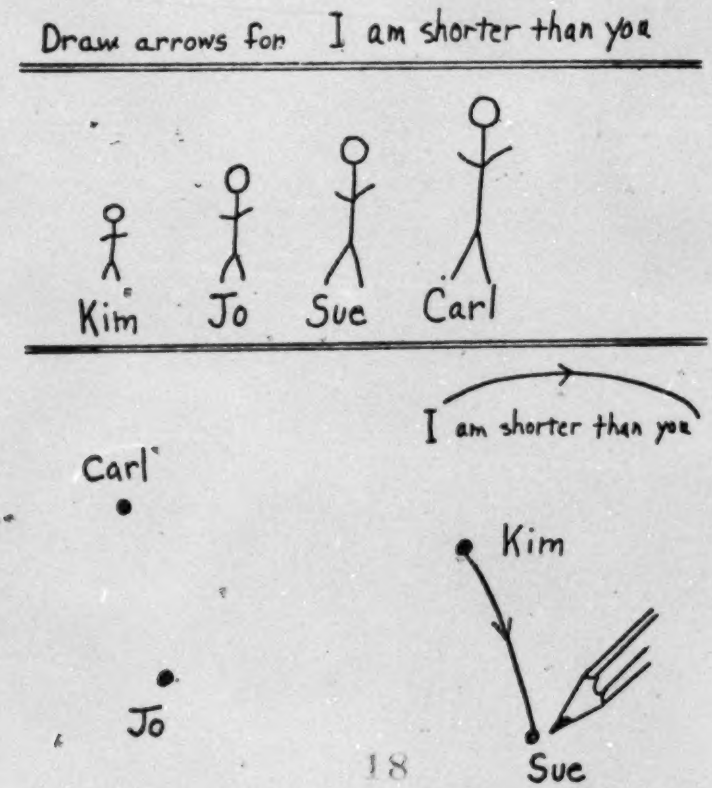
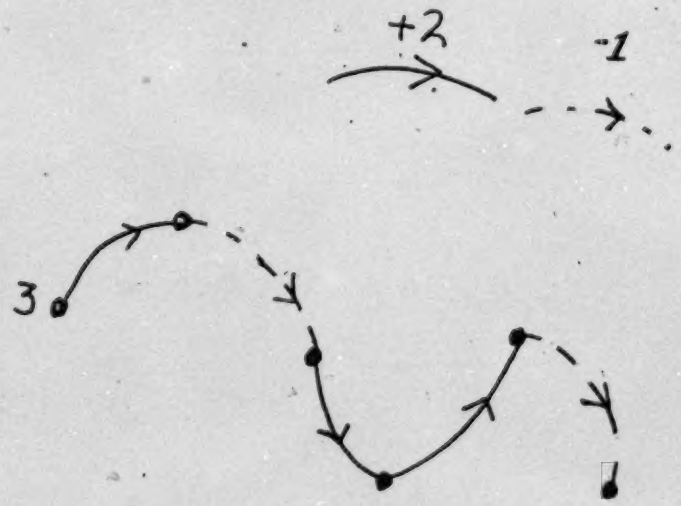


Table 8

Item Analysis for Subtest 6
Relations - composition functions

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	3 +2	65	68
2	5 -1	52	62
3*	4 +2	61	75
4	6 +2	53	61
5	8 -1	49	53
	Mean % Number of students KR20	56 106 .85	64 114 .81

Label the dots



(Each item scored independently. If item 1 was incorrect, say 4, then correct answer for item 2 would be 4-1=3.)

Table 9

Item Analysis for Subtest 7
Addition

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	3 + 3 = ☐	94	96
2	2 + 5 = ☐	89	93
3	9 + 2 = ☐	87	89
4	7 + 7 ☐	79	80
5	50 + 40 = ☐	45	45
6	37 + 15 = ☐	30	38
	Mean %	71	74
	Number of students	121	121
	KR20	.71	.67

Table 10

Item Analysis for Subtest 8
Subtraction - Dot Pictures

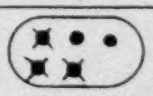
Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	5 - 3 = ___ 	95	96
2	10 - 7 = ___	93	97
3	3 - 0 = ___	85	70
	Mean %	91	88
	Number of students	100	112
	KR20	.49	.49

Table 11

Item Analysis for Subtest 9
Rationals - Multiplication

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	1/2 X 6 = ___	57	60
2	1/2 X 12 = ___	48	55
3*	1/3 X 9 = ___	32	43
	Mean % Number of students KR20	46 106 .88	53 112 .84

Table 12

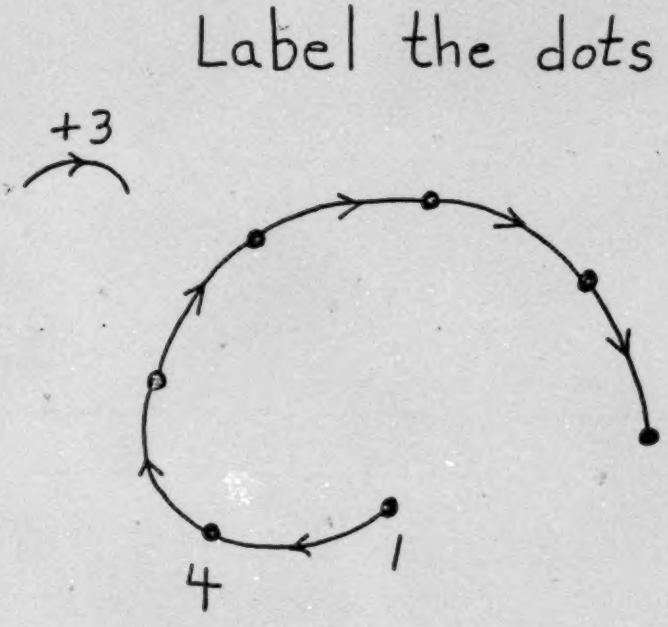
Item Analysis for Subtest 10
Integers

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	$\hat{2}$ + 4 = ___	93	96
2*	8 + $\hat{8}$ = ___	63	80
3*	2 + $\hat{3}$ = ___	44	65
4*	9 + $\hat{1}$ = ___	60	80
	Mean % Number of students KR20	65 106 .79	82 112 .72

Table 13

Item Analysis for Subtest 11
Relations - +3 Addition Spiral

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	4 +3	72	83
2*	7 +3	68	84
3*	10 +3	66	82
4*	13 +3	65	80
5*	16 +3	60	79
	Mean % Number of students KR20	66 106 .94	82 112 .94



(Each item scored independently. For example, if item 1 was incorrect, say 6, then the correct answer to item 2 would be 6+3=9.)

Table 14

Item Analysis for Subtest 12
Numerals and Counting

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	Put an X on 47: 74, 407, 47, 147	83	90
2	Put an X on 16: 16, 106, 61, 610	83	88
3	What number belongs in the empty space: 53, 54, 55, __, 57	83	82
4	Write the number that comes just before 13.	69	80
5	Write the number that is 2 more than 28.	71	64
6	Put in the missing number to show counting by 2's: 56,58, __, 62, 64	62	61
	Mean %	75	78
	Number of students	127	245
	KR20	.71	.61

Table 15

Item Analysis for Subtest 13
Order

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	Put an X on the smallest number: 72, 53, 49	80	86
2	Put an X on the largest number: 10, 5, 12, 13	79	77
	Mean %	80	82
	Number of students	127	245
	KR20	.37	.52

Table 16

Item Analysis for Subtest 14
Minicomputer - Reading and Writing Numbers

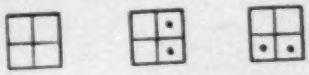
Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	Show 90 on the MC.	73	75
2	Show 821 on the MC.	78	80
3	What number does the MC show? 	78	83
4	What number does the MC show?	55	59
	Mean % Number of students KR20	71 100 .70	74 245 .72

Table 17

Item Analysis for Subtest 15
Minicomputer - Addition, Multiplication, Subtraction

Item Number	Abbreviated Form of Item	% Correct With Inexperienced Teachers	% Correct With Experienced Teachers
1	Use the MC to find: 36 + 42 = ___	52	56
2	Use the MC to find: 16 + 45 = ___	47	46
3	Use the MC to find: 2 X 47 = ___	48	48
4	Use the MC to find: 3 X 16 = ___	34	35
5	Use the MC to find: 37 - 15 = ___	54	54
6	Use the MC to find: 78 - 34 = ___	32	29
	Mean % Number of students KR20	45 100 .81	45 226 .77

Table 18

Item Analysis for Subtest 16
Larger Numbers

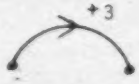
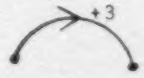
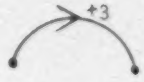
Item Number	Abbreviated Form of Item	% Correct With Inexperienced	% Correct With Experienced
1	28 + 34*	30	46
2	95 + 48**	9	9
	Mean % Number of students	19 121	28 255

*Students were given only 10 seconds to write their estimate of the correct answer. Answers from 51-79 were scored as correct.
**Answers from 130 to 149 were scored as correct.

Table 19 below lists from all the subtests, those items on which the classes with an experienced CSMP teacher had a significantly higher percent of correct responses than last year's classes.

Table 19

Items on Which Students With
Experienced CSMP Teachers Scored Better

Test and Item Number	Abbreviated Form of Item	% Correct With Inexperienced CSMP Teacher	% Correct With Experienced CSMP Teacher
Test 5, #3	Drawing an arrow from Joe to Carl	53	68
Test 5, #4	Drawing an arrow from Joe to Sue	54	64
Test 6, #3		61	75
Test 9, #3	1/3 X 9 = ___	32	43
Test 10, #2	8 + $\hat{8}$ = ___	63	80
Test 10, #3	2 + $\hat{3}$ = ___	44	65
Test 10, #4	9 + $\hat{1}$ = ___	60	88
Test 11, #2		68	84
Test 11, #3		66	82
Test 11, #4		65	80
Test 11, #5		60	79

Most of the items on which this year's classes did significantly better than last year's classes were items on content unique to CSMP, in particular, addition of integers and the +3 addition spiral. In both cases this year's classes did significantly better than last year's classes on all but one of the items in the subtest. This may indicate that the teachers are more familiar and at ease with arrow diagrams and negative numbers this year.

The only item on which last year's classes scored significantly higher than this year's classes was on subtest 8 item 3 (3-0=□). Eighty-five percent of last year's students correctly answered this item while seventy percent of this year's students answered it correctly.

Comparisons Involving Original Comparison Teachers

CSMP - Non-CSMP Comparison

Five teachers, who were comparison teachers for CSMP classes last year (1973-74), taught CSMP classes for the first time this year (1974-75). Thus a comparison of the performance of those teachers' students from 1973-74 (Non-CSMP curriculum) to 1974-75 (CSMP curriculum) provides additional evidence regarding CSMP - Non-CSMP performance. The difference from last year's study is that then the students in the classes being paired were known to be of about equal ability and the teachers were different whereas now the teachers are the same and the students are only assumed to be of equal ability. Last year these teachers' classes took subtests 1, 7, 12, 13, 16 and their classes were tested again this year. Table 20 shows, for each teacher, last year's and this year's class means for the 22 items on these five subtests. These class means provide the basis for the statistical analysis to follow.

Table 20

Mean Class Scores
Non-CSMP Classes 73-74 and
CSMP Classes 74-75

Class	N-CSMP Means 73-74	CSMP Means 74-75
1	17.8	17.2
2	11.8	13.4
3	15.8	15.0
4	15.5	17.3
5	15.4	16.9

Three of the five teachers had classes that showed a slight increase of 1.5 to 1.8 in their class means while the other two classes had decreases in their class means of less than one point.

The Analysis of Class Means was carried out in the same manner as before. Table 21 presents the means across CSMP and across Non-CSMP classes for each of the subtests and for the total, as well as the appropriate significance test.

Table 21

Mean Subtest Scores
Non-CSMP 73-74 and CSMP 74-75, Same Teachers

Test	N-CSMP Means 73-74	CSMP Mean 74-75	F-test P less than	
Subtest 1: Subtraction	4.0	3.8	.51	with 1 and 4 d.f.
Subtest 7: Addition	4.3	4.7	.16	
Subtest 12: Numerals & Counting	4.9	5.0	.79	
Subtest 13: Order	1.8	1.7	.49	
Subtest 16: Larger Numbers	.2	.7	.04	
Total	15.2	15.9	.28	

Table 21 tends to corroborate the findings in last year's CSMP - Non-CSMP comparisons. Subtest 16 was the only subtest on which there was a significant difference between the two groups, with the CSMP students scoring higher. It was also true last year that CSMP students did better than Non-CSMP students on these items. Non-CSMP students did better, though not significantly so, on Subtest 1, Subtraction, and this was the one area out of eight in which last year's Non-CSMP students outperformed the CSMP students, though again the difference did not approach significance.

These results add credence to data reported last year. With a different group of teachers, approximately the same results were obtained in comparing the performance of CSMP and Non-CSMP classes. It should be noted that the data reported here is rather skimpy. Of necessity it is based on only a few (5) classes and on only a portion of the considerable test items from that study.

Last Year's CSMP and Comparison Teachers

In order to investigate the possibility that the results from last year's study, generally favorable to CSMP, might be accounted for by a superiority of the CSMP teachers over the comparison teachers, the performance of two groups of classes was compared. One group consisted of the classes of five of the original CSMP teachers the first time they taught CSMP (1973-74); this data was collected last year. The other group consisted of the (1974-75) classes of the five teachers who served as the corresponding comparison teachers that first year - 1974-75 was the first time this group of teachers taught CSMP. Again the assumption is made that the ability levels of these two groups of students is about the same. It should be noted that there were in fact 16 CSMP - Non-CSMP pairs of classes last year and this data is based on only those five classes where last year's comparison teachers began to teach CSMP this year.

Table 22 gives the mean scores for these two groups of classes.

Table 22

Mean score of Last Year's and This Year's
CSMP Classes with Inexperienced Teachers

Mean across 5 classes with inexperienced CSMP teachers last year.	Mean across 5 classes with inexperienced CSMP teachers this year (teachers had comparison classes last year).	F-test P less than*
43.9	47.3	.24

*With 1 and 4 degrees of freedom.

As can be seen in Table 22, the mean scores for the classes of inexperienced CSMP teachers this year is higher, but not significantly so, than the means of the classes of inexperienced CSMP teachers last year. Thus the comparison teachers of original study do just as good a job teaching CSMP for the first time as did the original group of CSMP teachers. This evidence supports the view that the results obtained in the original study were not due to the superiority of CSMP teachers.

Summary and Conclusions

1. In 1973-74, 16 teachers in five school districts of the metropolitan St. Louis area, after attending a one-week training session, taught the CSMP curriculum to their first grade students for the first time. This year, 1974-75, 12 of the 16 teachers again taught a CSMP first grade class and five new teachers, who had served as comparison teachers in 1973-74, attended a one-week training session and began to teach the CSMP curriculum for the first time.

2. Items were selected from a battery of tests administered to CSMP and comparison classes last year. Sixteen subtests were developed covering 11 content topics.

3. This set of subtests was divided into three parts. Within each of the 17 classes one part was administered to a random half of the students, the second part was administered to the remaining half of the students and the third part was administered to all students. The administration of the testing was carried out by two specially trained testers.

4. A univariate analysis of variance was used on the class means of each subtest. A comparison was made between student performance with inexperienced teachers and with the same teachers after one year's experience with CSMP and revealed the following:

   a) Classes with an experienced CSMP teacher scored significantly higher ($p<.05$) on Subtest 16: Larger Numbers.
   b) Classes with an experienced CSMP teacher scored higher (marginally significant with $p<.06$) on Subtest 11: Relations - +3 spiral.
   c) There were no differences approaching significance on the other subtests.

5. A review was made of the 11 items answered correctly by at least 10 percent more students with experienced CSMP teachers than students with inexperienced CSMP teachers. These items generally dealt with one of three content areas:

   a) Addition of integers
   b) Estimation of sums of two two-digit numbers
   c) Arrow diagrams

One item was answered correctly by at least 10 percent more students with an inexperienced CSMP teacher than students with an experienced CSMP teacher, namely a subtraction problem, 3-0=__.

6. A comparison of five CSMP classes in 1974-75 versus five non-CSMP classes in 1973-74 with the same teachers revealed the CSMP classes scores significantly higher ($p<.05$) on Subtest 16: Larger Numbers.

7. A comparison of five CSMP classes in 1973-74 (taught by an original group of CSMP teachers) with five CSMP classes in 1974-75 (taught by the five teachers who served as comparison teachers in 1973-74) indicated the comparison teachers did at least as well when teaching CSMP for the first time as did the original group of teachers.

In conclusion, it appears that CSMP teachers do just as well the second time around and that any loss due to the novelty effect of the program is more than balanced by the gain in experience. This is in agreement with statements made by these same teachers in a series of interviews conducted at the end of the school year (see Evaluation Report 2-C-3). In addition the data tends to corroborate the findings from last year and to cast some doubt on the possibility that in some cases CSMP students did better because they had better teachers. While the results are not strong enough (small numbers of teachers, no covariate scores such as pretest ability scores) to support a definite conclusion they tend to give additional credence to the results from last year.

Appendix A

List of Class Mean Scores

Mean scores for each of the subtests are given for each class on the next page.

The classes are listed as numbers 1 to 12 and each of these rows contains two sets of entries, one for the CSMP class in 1973-74 and one for the CSMP class in 1974-75.

Mean Test Scores for Each Class
First Entry: CSMP Class 73-74, Second Entry CSMP 74-75

Subtest / Class	Test 1 Subtraction	Test 2 Addition	Test 3 Counting	Test 4 Multiplication	Test 5 Relations	Test 6 Relations	Test 7 Addition	Test 8 Subtraction	Test 9 Rationals	Test 10 Integers	Test 11 Relations	Test 12 Counting	Test 13 Order	Test 14 MC	Test 15 MC	Test 16 Larger Numb
1	2.7 4.0	2.2 2.7	1.5 1.8	1.9 2.6	3.6 3.6	2.4 4.1	4.3 4.8	2.3 2.7	1.3 1.4	2.8 3.1	3.0 4.3	4.6 5.0	1.6 1.9	2.5 3.1	2.3 2.9	.5 .7
2	3.7 3.6	1.9 2.0	2.3 1.6	4.0 2.7	4.0 4.0	4.3 4.3	4.9 4.5	2.1 2.7	2.8 1.9	3.9 3.5	4.6 4.7	4.8 5.6	1.7 1.8	2.6 3.6	3.4 4.2	.6 .7
3	4.6 4.3	2.4 2.6	1.9 1.6	3.0 1.8	2.6 3.2	4.6 3.4	4.7 5.3	2.8 2.6	2.4 1.9	3.1 3.5	4.6 3.8	4.8 4.6	1.9 1.7	3.5 3.5	2.5 2.5	.4 .6
4	3.6 2.9	4.0 2.9	1.0 1.6	1.3 2.2	1.9 2.1	1.9 2.1	4.6 3.6	4.8 2.6	1.0 2.3	2.2 2.9	2.3 3.8	4.2 4.8	1.8 1.8	5.0 3.0	5.3 2.5	.1 .3
5	3.8 3.8						4.4 4.8					5.5 5.2	1.9 1.8			.4 .6
6	2.9 2.8	1.9 2.4	1.3 1.1	2.6 1.9	3.0 1.7	4.1 2.4	3.6 3.9	2.5 .9	1.3 .9	3.3 3.7	2.9 3.9	4.6 4.3	1.6 1.5	2.6 2.6	2.3 2.6	.4 .5
7	2.7 4.0	2.2 2.7	1.5 1.8	1.9 2.6	3.6 3.6	2.4 4.1	4.3 4.8	2.3 2.7	1.3 1.4	2.8 3.1	3.0 4.3	4.6 5.0	1.6 1.9	2.5 3.1	2.3 2.9	.5 .7
8	1.4 3.0	3.5 2.5	1.0 1.4	1.5 2.0	2.5 3.4	2.1 2.8	4.9 4.5	3.8 2.8	1.4 .8	2.2 3.5	2.5 3.7	4.4 4.8	1.7 1.7	3.0 3.1	2.1 2.6	.3 .5
9	4.3 4.7	2.5 2.8	1.8 1.8	4.9 3.2	4.3 3.5	3.5 4.0	4.9 5.3	2.8 2.9	2.5 2.7	4.3 3.7	4.5 5.0	4.4 4.2	1.6 1.5	1.3 3.5	1.4 2.8	.5 1.3
10	3.6 3.3	1.7 2.5	1.9 1.6	1.9 2.2	3.7 3.7	3.3 3.7	3.1 3.4	2.2 1.9	.4 .5	2.3 1.8	5.3 4.0	5.2 3.7	1.3 1.2	2.4 2.7	1.8 3.0	.0 .4
11	2.1 3.5	2.6 2.1	1.1 1.4	2.6 2.3	2.7 2.7	3.1 2.7	4.4 3.8	2.2 2.6	.9 1.2	2.8 2.7	2.9 3.5	2.8 4.3	1.3 1.3	3.2 2.7	4.1 1.8	.3 .5
12	2.0 3.9	1.3 2.3	.8 1.6	1.1 1.9	.3 3.6	1.8 3.6	2.6 4.0	2.0 2.8	1.1 1.8	1.3 3.2	2.3 4.2	2.8 4.4	.9 1.1	1.9 1.8	.8 .9	.2 .2
Mean	3.1 3.6	2.4 2.5	1.5 1.6	2.4 2.3	2.9 3.2	3.0 3.4	4.2 4.4	2.7 2.5	1.5 1.6	2.8 3.2	3.5 4.1	4.4 4.7	1.6 1.6	2.8 3.0	2.6 2.6	.4 .6
P-test: P-less than (d.f.)	.13 (1,11)	.77 (1,10)	.44 (1,10)	.69 (1,10)	.42 (1,10)	.35 (1,10)	.39 (1,11)	.44 (1,10)	.56 (1,10)	.18 (1,10)	.051 (1,10)	.30 (1,11)	.42 (1,11)	.54 (1,10)	.93 (1,10)	.005 (1,11)

Appendix B

First Grade Test

Test Booklet I - Subtests 1-6

Test Booklet II - Subtests 7-11

Test Booklet III - Subtests 12-16

The oral directions read to the student in test booklet II are given in small size type. These directions appeared in the Administrator's Copy but not in the Student Copy of the tests.

Subtest 1: Subtraction

Subtract

5 - 1 = ☐

9 - 9 = ☐

10 - 6 = ☐

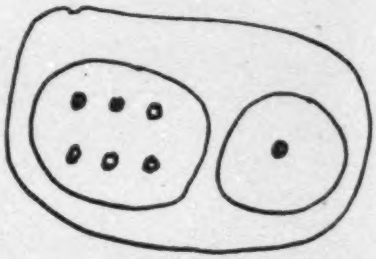
11 - 3 = ☐

80 - 20 = ☐

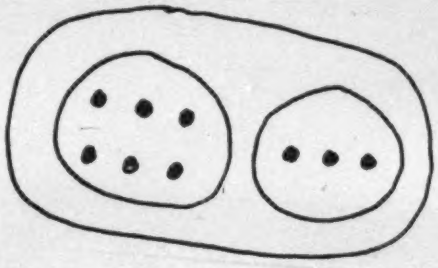
31 - 19 = ☐

Add

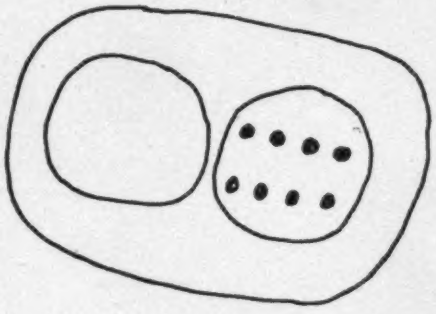
6 + 1 = ___



___ + 3 = ___



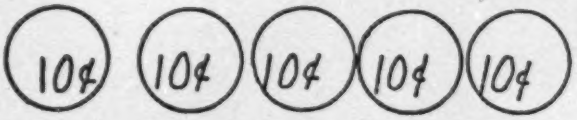
___ + ___ = ___



Subtest 3: Money

How much money?

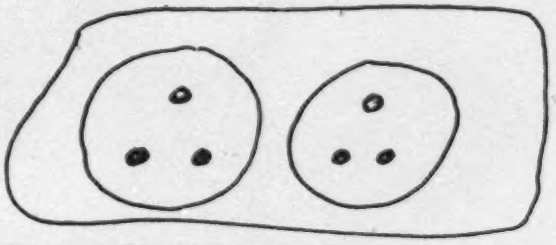
____¢



____¢

Subtest 4: Multiplication

Do these problems



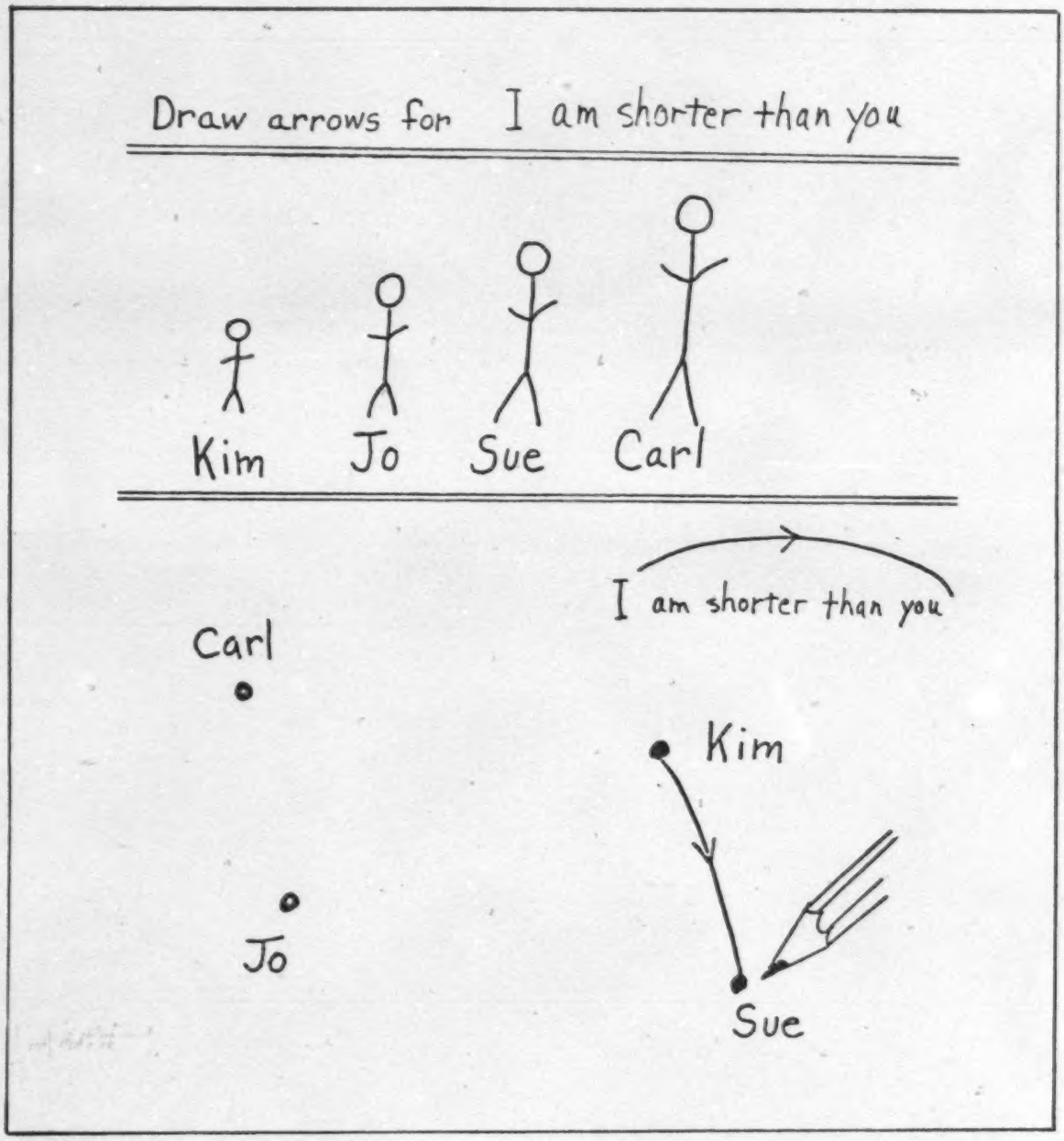
2 X 3 = ___

1 X 9 = ___

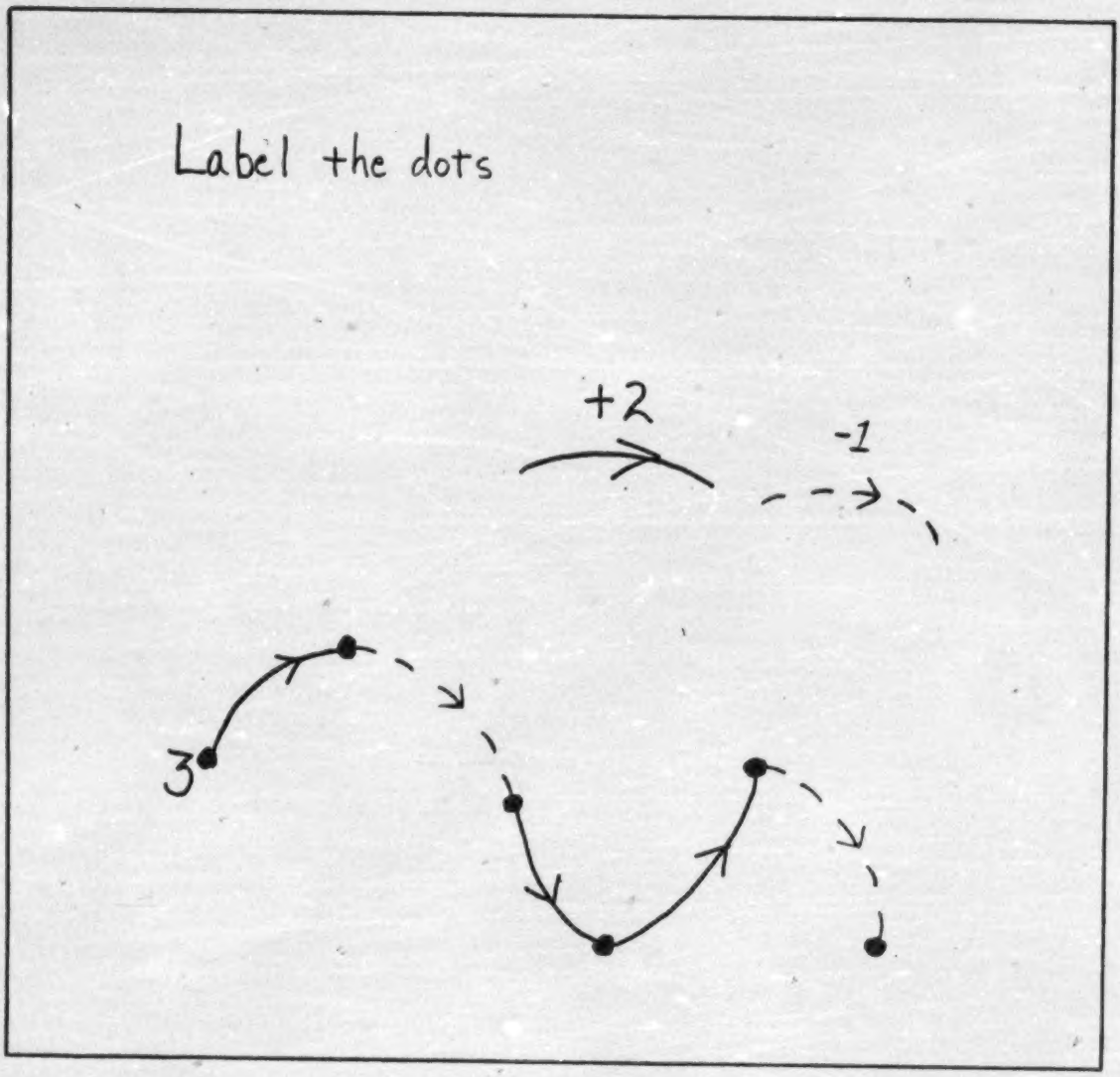
3 X 4 = ___

0 X 7 = ___

Subtest 5: Relations



Subtest 6: Relations



Subtest 7: Addition

Add

3 + 3 = ☐

2 + 5 = ☐

9 + 2 = ☐

7 + 7 = ☐

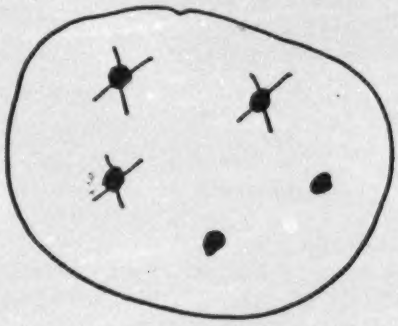
50 + 40 = ☐

37 + 15 = ☐

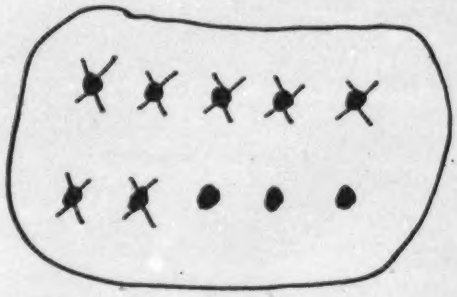
Subtest 8: Subtraction with Dots

Do these problems

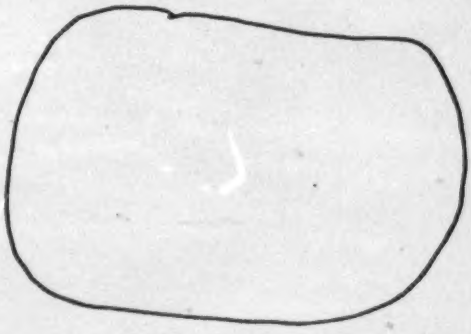
5-3 = ____



10-7 = ____



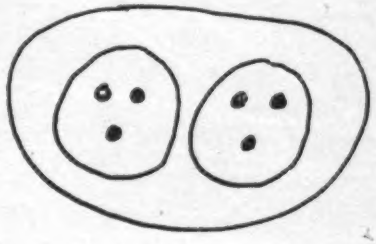
3-0 = ____



Subtest 9: Rationals

Do these problems

$\frac{1}{2} \times 6 =$ ____



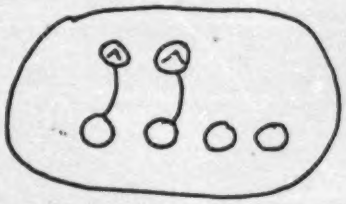
$\frac{1}{2} \times 12 =$ ____

$\frac{1}{3} \times 9 =$ ____

Subtest 10: Integers

Do these problems

$\hat{2} + 4 =$ ____

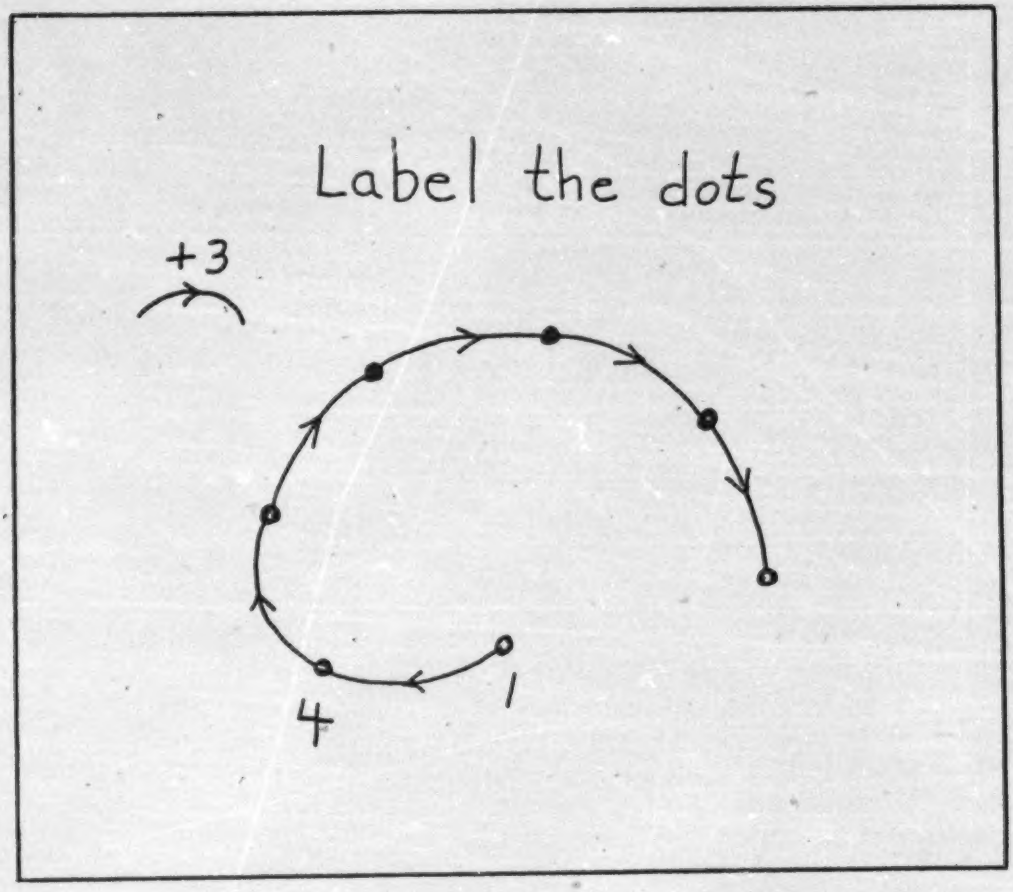


$8 + \hat{8} =$ ____

$2 + \hat{3} =$ ____

$9 + \hat{1} =$ ____

Subtest 11: Relations



Subtest 12: Numerals and Counting and Subtest 13: Order*

Look at the numbers at the top of the page.
Put an X on 47. (Pause. Repeat question.)

74 407 47 147

Now look at the numbers in the middle of the page.
Put an X on 16. (Pause. Repeat question.)

16 106 61 610

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* Look at the four numbers on the bottom of the page.
Put an X on the largest number. (Pause. Repeat question.)

10 5 12 13

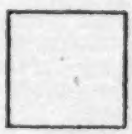
Subtests 12 and 13 (continued)

Look at the numbers at the top of the page.
They show counting by twos but one number is missing (point).
Now you put the missing number in the blank to show counting by twos.

56 , 58 , _____ , 62 , 64

Look at the bottom of the page.
What number is two more than 28?
Put your answer in the box.

2 more than 28



Subtests 12 and 13 (continued)

* Look at the three numbers at the top of the page.
Put an X on the smallest number.

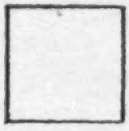
72 53 49

Now look at the numbers in the middle of the page. There is an empty space.
Fill in the number that belongs in the empty space.

53 , 54 , 55 , _____ , 57

Look at the bottom of the page.
What is the number that comes just before 13?
Put your answer in the box.

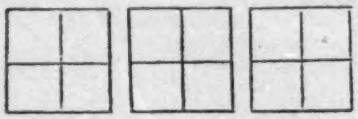
Just before 13



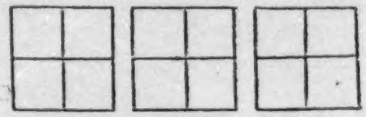
Subtest 14: Minicomputer

Show these numbers on the minicomputer

Look at the 2 problems at the top of the page. Put dots in the minicomputer squares to show the numbers that are given.



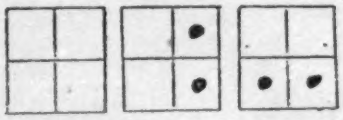
90



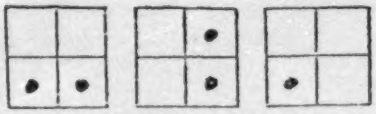
821

What number does the minicomputer show?

Look at the 2 problems at the bottom of the page. It says "What number does the minicomputer show?" Write your answers in the spaces below the minicomputers.



_____



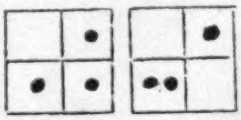
_____

Subtest 15: Minicomputer

Use your Minicomputer

Add

$36 + 42 =$ _____

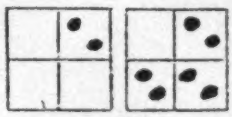


$16 + 45 =$

Everybody get your Minicomputers. (They should do it quickly and quietly.) Use your Minicomputers to do the problems on this page. The first 2 are addition problems the next 2 are multiplication problems and the last 2 are subtraction problems. We have given you a hint for the first problem in each section. Don't draw any more boxes on your workbook. Use your Minicomputer. Raise your hand if you have any questions.

Multiply

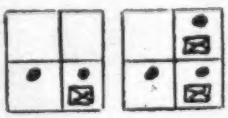
$2 \times 47 =$ _____



$3 \times 16 =$ _____

Subtract

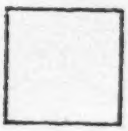
$37 - 15 =$ _____



$78 - 34 =$ _____

Subtest 16: Larger Numbers

I am going to put an addition question on the blackboard in a minute, but I'm only going to leave it on the board for a few seconds. You won't have time to figure out the exact answer, so just make a good guess and put your answer in the box at the top of the page (point). Here is the question. (Write 28+34 on the board.) Make the best guess you can and put your answer in the box. (Erase after exactly 10 seconds.)



Now I am going to put another question on the board and you put your answer in the box at the bottom of the page. Remember, just make the best guess you can. Here is the question. (Write 95+48 on the blackboard.) Put your answer in the box. (Erase after exactly 10 seconds.)